

REMARKS

Claims 43 to 45 and 47 to 80 are pending in the application; claim 46 is cancelled.

REJECTIONS

Rejection under 35 U.S.C. 102

Claims 43-58, 60-70, 75-80 stand rejected under 35 U.S.C. 102(e) as being anticipated by *Filipovsky et al.* (WO 99/39319).

Claim 43 has been amended by defining that the illumination system comprises:

- printed circuit boards having different sizes and provided with different numbers of LEDs in accordance with the different sizes,
- cables for connecting the printed circuit boards to one another and/or for connecting the printed circuit boards to a voltage source,
- attachment elements for attaching the printed circuit boards to a desired location,
- wherein, for illuminating a hollow element, several of the printed circuit boards are selected according to a shape of the hollow element and arranged and connected to one another following the shape of the hollow element, wherein the LEDs are LED chips and have an irradiation angle of more than 150° providing uniform illumination.

Claim 80 has been amended in that the method now defines the steps of

- providing printed circuit boards having different sizes and provided with different numbers of LEDs in accordance with the different sizes,
- selecting several of the printed circuit boards according to a shape of the hollow element;
- arranging and connecting the selected printed circuit boards to one another following the shape of the hollow element and attaching the printed circuit boards to a desired location by attachment elements,
- connecting the printed circuit boards to a voltage source by cables.

Accordingly, the present invention uses a modular principle essentially employing printed circuit boards of different sizes and provided, according to the size, with different

numbers of LEDs. Differently sized printed circuit boards provided with a corresponding number of LEDs are then selected in accordance with the shape of the hollow element to be illuminated in order to fill the contour or the shape of the hollow element with matching printed circuit boards. By selecting a proper number of printed circuit boards of a suitable size, it is possible to illuminate letters or numbers or other signs and characters uniformly by a simple plug-in system that can be easily installed without this requiring special skills. The inventive principle is particularly well demonstrated in Fig. 9 through 11 of the present intention.

Moreover, the applicant employs LEDs that are attached by the chip-on-board technology and are also referred to as LED chips. This chip-on-board technology enables particularly large irradiation angles greater than 150 degrees. Such LED chips provide a uniform illumination even if the LED chips are spaced apart at a greater distance than conventional LEDs; the spacing can be 14 mm to 20 mm. The chip-on-board technology provides for easy mounting of the LEDs on the printed circuit boards.

Also, the inventive printed circuit boards can be connected in a simple way by attachments elements. A simple and easy-to-use modular system is provided that is adaptable to any shape or contour and can be designed and assembled without any special skill. The different sizes of the printed circuit boards with matching LED placement enables proper illumination without requiring special calculations with regard to emission of light and luminance. The system is further improved by employing white-reflective surfaces and by optimizing reflection. The electrical connections are realized by a simple standardized plug system.

The cited prior art reference, on the other hand, only teaches to provide a printed circuit board that is shaped according to the desired shape of the letter or number or character, as illustrated in Fig. 13, and to secure upon such pre-shaped letter the LEDs in order to provide illumination of the pre-shaped object. Fig. 13 of the prior art shows the letter "A" provided with numerous LEDs on one and the same substrate or printed circuit board. Fig. 14 shows similarly that the pre-shaped outline or contour of the letter "A" is covered with numerous LEDs wherein again a single substrate is used to attach the LEDs. The concept of providing differently sized printed circuit boards that are provided with a

different number of LEDS matching the size of the printed circuit board and selecting an appropriate number of printed circuit boards to fill the shape of the letter or character is not suggested by this prior art reference.

Also, the prior art employs standard LEDs (small diameter of 3 to 5 mm) which have only a small irradiation angle and thus require the letter or character to be covered almost completely with LEDs as shown in Figs. 13 and 14 of the prior art. If the entire surface area to be illuminated is not covered completely, the illumination would be spotty and irregular. Moreover, the LEDs must be soldered individually, and this is time consuming for such a dense arrangement.

Rejection under 35 U.S.C. 103

Claims 59, 71-74 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Filipovsky et al.* (WO 99/39319).

Claim 59 has been amended to define a printed circuit board having a number of LEDs, wherein the LEDS are LED chips and have an irradiation angle of more than 150°, preferably 175° to 180°.

Such a printed circuit board provided with LEDs of the LED chip type is not disclosed in the prior art reference. The LEDs employed in the prior art are standard LEDs which have a small angle of irradiation and therefore necessitate a complete coverage of the letter or character to be illuminated with LEDs.

The LEDs claimed in the present invention are attached by the chip-on-board technology and are also referred to as LED chips. This chip-on-board technology enables particularly large irradiation angles greater than 150 degrees. Such LED chips provide a uniform illumination even if the LED chips are spaced apart at a greater distance than conventional LEDs; the spacing can be 14 mm to 20. The chip-on-board technology provides for easy mounting of the LEDs on the printed circuit boards, in contrast to the soldering required for standard LEDs.

CONCLUSION

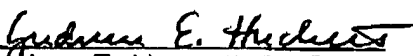
In view of the foregoing, it is submitted that this application is now in condition for allowance and such allowance is respectfully solicited.

Should the Examiner have any further objections or suggestions, the undersigned would appreciate a phone call or e-mail notification from the examiner to discuss appropriate amendments to place the application into condition for allowance.

Please note the attached change of correspondence address form and mail all future correspondence to the new address associated with the customer number indicated on this form.

Authorization is herewith given to charge any fees or any shortages in any fees required during prosecution of this application and not paid by other means to Patent and Trademark Office deposit account 50-1199.

Respectfully submitted on April 7, 2003,


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Encl.: - amended claims (clean copies and marked-up version - 2 sheets)
- time extension petition (1 sheet)
- change of correspondence address (1 sheet)